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IS 13984-1 (1995): Link and Test Connectors, Part 1: Test Schedule and Requirements [LITD 3: Electromechanical Components and Mechanical Structures for Electronic Equipment]



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सम्पर्क और परीक्षण संयोजनों की विशिष्टि

भाग 1 परिचय अनुसूची और अपेक्षाएँ

Indian Standard

**LINK AND TEST CONNECTORS —
SPECIFICATION**

PART 1 TEST SCHEDULE AND REQUIREMENTS

ICS 29.120.30 : 31.020

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

FOREWORD

This Indian Standard (Part 1) was adopted by the Bureau of Indian Standards, after the draft finalized by the Connectors for Electronic Equipment Sectional Committee had been approved by the Electronics and Telecommunication Division Council.

This standard is one of the series of Indian Standards on low frequency connectors below 3 MHz used in electronic equipment and shall be read in conjunction with IS 9647 : 1986 'General requirements and methods of test for low frequency connectors below 3 MHz including dc (*first revision*)'. Subsequent parts of this standard will cover detail specification for specific types of connectors.

While preparing this standard, assistance has been derived from IEC Pub 130-12 (1976) 'Connectors for frequencies below 3MHz : Part 12 Link and test connectors', issued by the International Electrotechnical Commission.

For the purpose of deciding whether a particular requirement of this standard is complied with the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

LINK AND TEST CONNECTORS — SPECIFICATION

PART 1 TEST SCHEDULE AND REQUIREMENTS

1 SCOPE

This standard specifies test schedule and requirements for following two series of link and test connectors:

- a) A series of the conventional wiring type,
- b) A series to be directly soldered on a printed board with a nominal thickness up to 1.6 mm (0.063 inches) according to IS 7405 (Part 1) : 1983, and
- c) U-Link plugs and cord plug.

NOTE — The terminations may be reduced or bent over after assembly to comply with IS 8943 : 1978.

2 REFERENCES

The following Indian Standards have been referred to in this standard:

IS No.	Title
1885 (Part 40) : 1974	Electrotechnical vocabulary: Part 40 Connectors
7405 (Part 1) : 1983	Specification for printed wiring board: Part 1 General requirements and methods of tests (<i>first revision</i>)
8943 : 1978	Guide to the design and use of components intended for mounting on boards with printed wiring and printed circuits
9647 : 1986	General requirements and methods of test for low frequency connectors below 3 MHz including dc (<i>first revision</i>)
10424 : 1982	Guide for use and design of printed boards
10673 : 1983	Sampling plans and proce- dures for inspection by attributes for electronic items

3 TERMINOLOGY

The terms and definitions given in IS 1885 (Part 40) : 1974 and IS 9647 : 1986 shall apply.

4 MATERIALS AND WORKMANSHIP

The materials used and workmanship shall be in accordance with 4 of IS 9647 : 1986 in addition to the following materials:

For two-way, three-way, four-way and six-way sockets for conventional wiring:

Insulators : Moulded phenolics

Contacts : Phosphor bronze

Plating : 0.50 Micron gold over Nickel

(Since these have tags for conventional wire solder and need soldering iron with - 350°C temperature, thermoplastic materials are unsuitable).

For sockets for mounting on printing wiring boards:

Insulators : G. F. polyester

Contacts : Phosphor bronze

Plating : 0.50 Micron gold over nickel

(Only G. F. Polyester which stands board cleaning solvents is recommended. Polycarbonate is attacked by cleaning solvents).

For U-Link plugs:

Insulators : G. F. polyester/polycarbonate

Contacts : Brass

Plating : 0.5 Micron gold over Nickel

5 TYPE DESIGNATION

5.1 A connector according to this standard shall be designated by:

- a) The reference to this Indian Standard,
- b) The letters 'IS' representing Indian Standard,
- c) A letter 'P' or 'S' denoting whether the connector is a Plug or a Socket, and
- d) A serial number denoting the type of connector (see Table 1).

NOTE — The colour of the connectors shall be chosen as agreed between the manufacturer and the customer.

5.2 The type designation shall be given in accordance with 5.1 and an example is given below:

XXXX IS - P/S YY

where

XXXX = represents the reference number of Indian Standard,

IS = denotes Indian Standard,

P/S = denotes whether connector is a Plug/Socket, and

YY = denotes the serial number allotted to the type of connector (see Table 1).

6 DIMENSIONS

6.1 The outline and dimensions shall be as given in the relevant detail specification (Parts 2 to 5 of this standard). The shape of the connectors may deviate from those given in the detail specifications as long as the specified dimensions are not influenced.

6.2 Terminals and, if present, additional fixing pins are located so as to fit into holes lying on a grid according to Appendix A of IS 10424 : 1982.

NOTE — With respect to terminations, reference is made to IS 8943 : 1978.

6.3 Mounting

6.3.1 The Fig. 1 and Fig. 2 and the table there under show parallel-to-board mounting and standing-on-board mounting respectively.

6.3.2 Some typical examples of mounting and applications are given in Annex A and Annex B respectively.

7 GAUGES (see Fig. 3)

7.1 Sizing Gauge (Gauge 1)

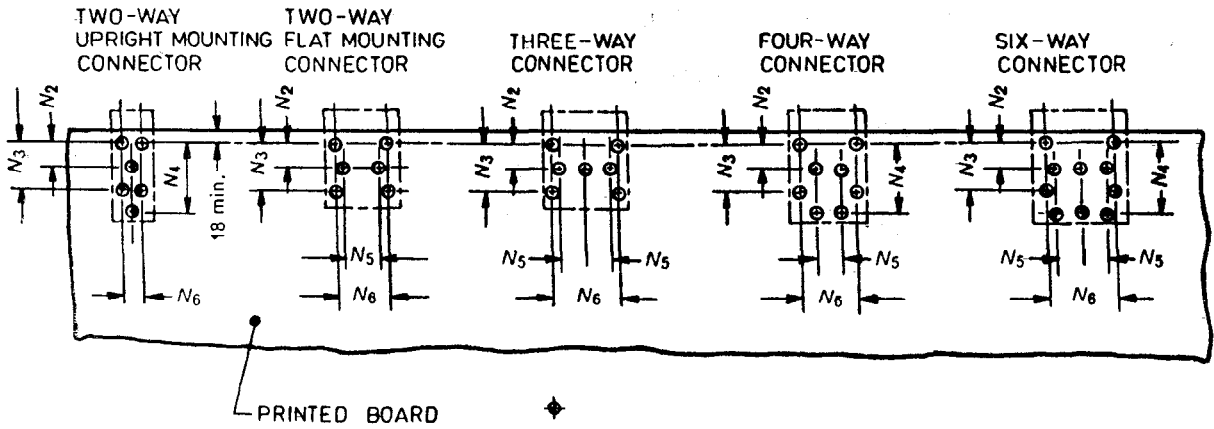
Material : Hardened tool steel

7.2 Retention Force Measuring Gauge (Gauge 2)

Material : Hardened tool steel, weighing 40 ± 5 g and having a surface roughness at all faces of: $0.16 \mu\text{m}$ to $0.25 \mu\text{m}$.

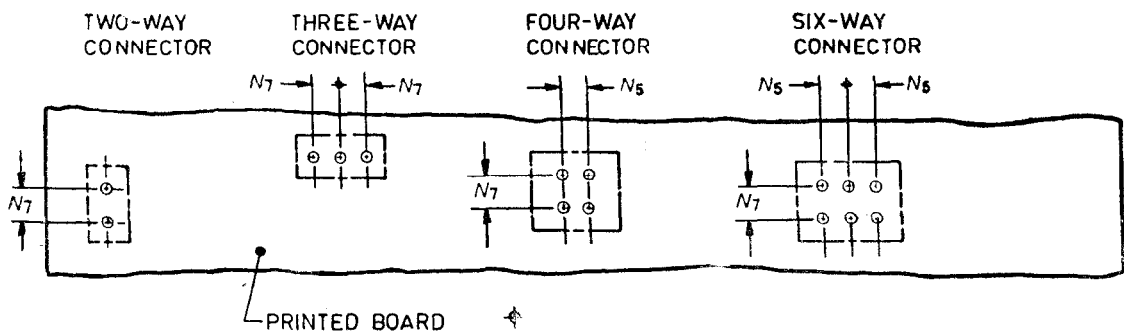
Table 1 Type of Design for Plugs and Sockets
(Clauses 5.1 and 5.2)

Socket				U-Link Plug		Cord Plug	
Type	SI No.			Type	SI No.	Type	SI No.
	For conventional wiring	For mounting on printed wiring boards					
		Stand-on-board mounted	Parallel-to-board mounting				
Two-way	S01	S101	Flat mounting S201	U-Link polarized	P01	Polarized	P101
			Upright mounting S211				
Three-way	S02	S102	S202	U-Link, non-polarized	P02		
Four-way	S03	S103	S203	Double U-Link polarized	P03		
Six-way	S04	S104	S204				



Holes for electrical and mechanical connection 1.3 mm nominal diameter in accordance with IS 7405 : 1965.

FIG. 1 PARALLEL-TO-BOARD MOUNTING



Holes for electrical and mechanical connection 1.3 mm nominal diameter in accordance with IS 7405 : 1965.

FIG. 2 STANDING-ON-BOARD MOUNTING

All dimensions in millimetres.

Number of Ways	Type			N_2	N_3	N_4	N_5	N_6	N_7
Two-way Connector	Flat mounting	S101	S201	3.81	7.62	—	5.08	7.62	5.08
			S211	3.81	7.62	11.43	—	2.54	
	Upright mounting	S102	S202	3.81	7.62	—	3.81	10.16	3.81
			S203	3.81	7.62	11.43	3.81	6.35	
Four-way Connector	—	S103	S203	3.81	7.62	11.43	3.81	6.35	5.08
Six-way Connector	—	S104	S204	3.81	7.62	11.43	3.81	10.16	5.08

7.3 Contact Resistance Measuring Gauge (Gauge 3)

Material : Beryllium copper, gold-plated,
 $5^{+5}_{-0} \mu\text{m}$ thickness.

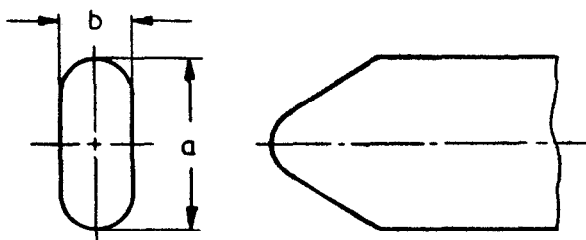


FIG 3 GAUGES

Gauge	Dimensions	mm	
		Min	Max
1	a	1.94	1.95
	b	0.79	0.80
2	a	1.90	1.91
	b	0.75	0.76
3	a	1.90	1.91
	b	0.75	0.76

8 RATED VALUES

Rated voltage : 250 V rms (not for mains)

Rated current : 8 A

9 CLIMATIC CATEGORIES

Climatic category : 40/70/21

Temperature range : -40°C to $+70^{\circ}\text{C}$

Damp heat, steady : 21 days
state

Severity : H 12 (Number of
cycles = 2 and Number
of days = 21)

10 TESTS**10.1 General**

The test schedule specifies the test, the order in which they shall be carried out and the requirements to be met.

10.2 Conditions of Tests

The provisions of 8 of IS 9647 : 1986 shall apply.

10.3 Classification of Tests

The provisions of 7 of IS 9647 : 1986 shall apply.

10.4 Test Schedule**10.4.1 Type Tests**

The test schedule for type tests, the sequence of tests and the number of samples shall be as specified in Table 2. Unless otherwise specified the mated sets of connectors shall be tested in all instances.

10.4.2 Routine Tests

The following tests shall be carried out in the order stated:

- Visual examination (see 9 of IS 9647 : 1986 for methods of tests); and
- Voltage proof (Duration 5 seconds) (see 12.5 of IS 9647 : 1986 for methods of tests).

10.4.3 Acceptance Tests

Two groups of samples (Group A and Group B) shall be selected preferably at random from the lot that has passed routine tests stated in 10.4.2. Each group of connectors shall be subjected to the tests in the order given in Table 3.

11 MARKING

11.1 Each piece of connector shall be legibly and indelibly marked with the following:

- Type designation in accordance with the relevant specification,
- Manufacturer's name or trade-mark,
- Identification on contacts as indicated by the relevant specification,
- Any other mark as agreed to between the manufacturer and the customer, and
- Country of manufacturer.

11.2 BIS Certification Marking

The connector may also be marked with the Standard Mark.

11.2.1 The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act, 1986* and the rules and regulations made thereunder. The details of conditions under which the licence for the use of Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

Table 2 Schedule of Type Tests
(Clause 10.4.1)

Test	Clause Ref of IS 9647 : 1986	Conditions of Test	Requirements
1) Zero group (All 18 samples)			
a) Visual examination	9.1	Mated and unmated	—
b) Dimensions	10.1	—	See detail Specification
Preconditioning	8.3	6 days unmated	—
c) Insertion and withdrawal force	14.1	—	4.0 N (<i>Max</i>) per contact (Engage-ment) 0.7 N (<i>Min</i>) per contact (Disengage-ment)
d) Gauge retention force	13.2	Sizing 5 times with gauge 1; testing with gauge 2	—
e) Contact resistance	12.1	a) Measurements on contacts of mated sets of connectors; 4 contacts per connector to be measured b) Measurement on individual resilient socket contacts; 4 other contacts per connector to be measured with gauge 3	10 m Ω <i>Max</i> 10 m Ω <i>Max</i>
		NOTE — For six contact sockets, 4 contact plugs and 2 contact plugs should be submitted as test sample mated pairs.	
f) Insulation resistance	12.4	DC voltage = 100 $\pm$ 15 V	500 M Ω <i>Min</i>
g) Voltage proof	12.5	E = 700 V r.m.s.	—
h) Polarization	13.13	—	—
2) First group (6 Samples)			
a) Robustness of socket termination	13.15	Test U _a : 20 N Solder terminations : Test U _b (Tag terminations); 3 bends	—
b) Mechanical strength	14.2	Total number of falls = 100	—
c) Soldering	13.14	Sockets for conventional wiring and cord ended plug; Method soldering iron; size B. Socket for mounting on printed wiring boards; Method solder bath-recovery; time 1 h.	—
d) Voltage proof	12.5	E = 700 V r.m.s.	—
e) Rapid change of temperature	16.4	Five cycles	—
i) Insulation resistance	12.4	DC Voltage = 100 $\pm$ 15 V	500 M Ω <i>Min</i>
ii) Voltage proof	12.5	E = 700 V r.m.s.	—
iii) Visual examination	9	—	—
f) Vibration including variation of contact resistance	14.13 and 12.2	During vibration	—
i) Visual examination	9	—	—
ii) Dry circuit	Appendix B B 1	—	The mated pair of connectors shall show no electrical discontinuity and the contact-resistances shall be as specified

Table 2 (Continued)

Test	Clause Ref of IS IS 9647 : 1986	Conditions of Test	Requirements
iii) Contact resistance	12.1	—	10 m Ω <i>Max</i>
g) Bumping and shock	14.11 and 14.12	—	—
i) Visual examination	9	—	—
ii) Contact resistance	12.1	—	10 m Ω <i>Max</i>
h) Dry heat	16.2.1	+70°C (with no current)	—
j) Insulation resistance at high temperature	12.4	DC Voltage = 100 $\pm$ 15 V	10 ³ M Ω <i>Min</i>
k) Damp heat accelerated (First cycle)	16.2.2	One cycle	—
m) Cold	16.2.3	- 40°C	—
n) Contact resistance at low temperature	12.1	—	10 m Ω <i>Max</i>
p) Low air pressure	16.2.4	300 m bar, +15°C to +35°C Test voltage E = 225 V r.m.s.	—
q) Damp heat accelerated (remaining cycles)	16.2.5	One cycle	—
<i>Final measurements :</i>			
i) Contact resistance	12.1	—	10 m Ω <i>Max</i>
ii) Insulation resistance	12.4	100 $\pm$ 15 V	10 ³ M Ω <i>Min</i>
iii) Voltage proof	12.5	E = 700 V r.m.s.	—
iv) Gauge retention force	13.2	Testing with gauge 2	—
v) Visual examination	9	—	—
r) Mould growth (1/2 lot)	16.8	—	After the expiry of the specified period of exposure, there shall be no mould growth on the connectors visible to the naked eye
s) Salt mist (1/2 lot)	16.9	—	—
i) Visual examination	9	—	—
ii) Voltage proof	12.5	E = 700 V r.m.s	—
iii) Insulation resistance	12.4	DC Voltage = 100 $\pm$ 15 V	10 ³ M Ω <i>Min</i>
iv) Contact resistance	12.1	—	10 m Ω <i>Max</i>
v) Insertion and withdra- wal force	14.1	—	4.0 N (<i>Max</i>) per contact (Engagement) 0.7 N (<i>Min</i>) per con- tact (Disengage- ment)
3) Second group (4 Samples)			
a) Mechanical endurance test (First part)	17	500 operations, velocity of operations = 10 mm/s (Average), Resting time when unmated = 30 s	—
b) Salt mist	16.9	—	—
i) Contact resistance	12.1	—	10 m Ω <i>Max</i>
ii) Voltage proof	12.5	E = 700 V r.m.s.	—
iii) Visual examination	9	—	—
c) Mechanical endurance test (Second part)	17	500 operations, Velocity of operations = 10 mm/s (Average), Resting time when unmated = 30 s	—
<i>Final measurements :</i>			
i) Contact resistance	12.1	—	10 m Ω <i>Max</i>
ii) Vibration including variation of contact resistance	12.2	—	—

Table 2 (Concluded)

Test	Clause Ref of IS 9647 : 1986	Conditions of Test	Requirements
iii) Insulation resistance	12.4	DC voltage = 100 ± 15 V	10^3 M Ω Min
iv) Voltage proof	12.5	E = 700 V r.m.s	—
v) Gauge retention force	13.2	Testing with gauge 2	—
vi) Visual examination	9	—	—
d) Dust	16.10	—	—
i) Contact resistance	12.1	—	10 m Ω Max
ii) Insulation resistance	12.4	DC voltage = 100 ± 15 V	10^3 M Ω Min
iii) Voltage proof	12.5	E = 700 V r.m.s	—
iv) Visual examination	9	—	—
4) Third group (4 Samples)			
a) Damp heat (Steady state)	16.3	56 days	—
Final measurements :			
i) Contact resistance	12.1	—	10 m Ω Max
ii) Insulation resistance	12.4	DC voltage = 100 ± 15 V	10^3 M Ω Min
iii) Voltage proof	12.5	E = 700 V r.m.s	—
iv) Visual examination	9	—	—
5) Fourth group (4 Samples)			
a) Discharge test	12.6	—	600 V Min
b) Electrical endurance test	18	8 A at +70°C, 1 000 h	—
Final measurements :			
i) Insulation resistance (hot)	12.4	DC voltage = 100 ± 15 V	10^3 M Ω Min
ii) Contact resistance	12.1	—	10 m Ω Max
iii) Insulation resistance	12.4	DC voltage = 100 ± 15 V	10^3 M Ω Min
iv) Discharge test	12.6	—	600 V Min
v) Voltage proof	12.5	E = 700 V r.m.s	—
vi) Visual examination	9	—	—

NOTE — Wherever the conditions of test and requirements are not given, the provisions of 8 of IS 9647 : 1986 shall apply for conditions of test and the corresponding clause of IS 9647 : 1986 for methods of test for that particular test shall be applicable for requirements.

Table 3 Schedule of Acceptance Tests
(Clause 10.4.3)

Test	Clause Ref of IS 9647 : 1986	AQL (Percent Defective)	Inspection Level IS 10673 : 1983	D/ND* (see Note)
Group A		1	II	ND
Insertion force	14.1			
Gauge retention force	13.2			
Contact resistance	12.1			
Insulation resistance	12.2			
Group B				
Sub-group 1		4	S-3	ND
Dimensions and mass	10			
Sub-Group 2		4	S-3	ND
Technical endurance test (Short term)	Annex C			
Electrical endurance test (Short term)	Annex C			
Sub-Group 3		4	S-3	D
Soldering	13.14			
Robustness of terminations	13.15			
Pump	14.11			
Climatic sequence	16.2			
Null	14.8			

NOTE — Samples which have been subjected to destructive tests shall not be returned to the lot.

D — Destructive/ND — Non-destructive.

ANNEX A
(Clause 6.3.2)

EXAMPLES OF MOUNTING

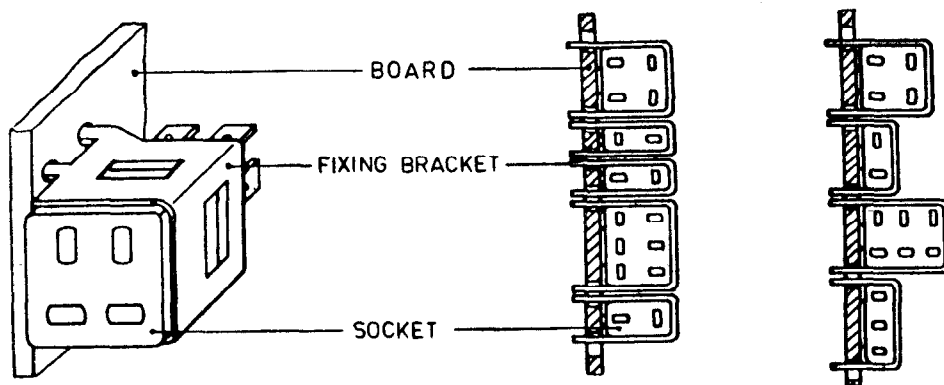


FIG. A-1 FOR BRACKET MOUNTING

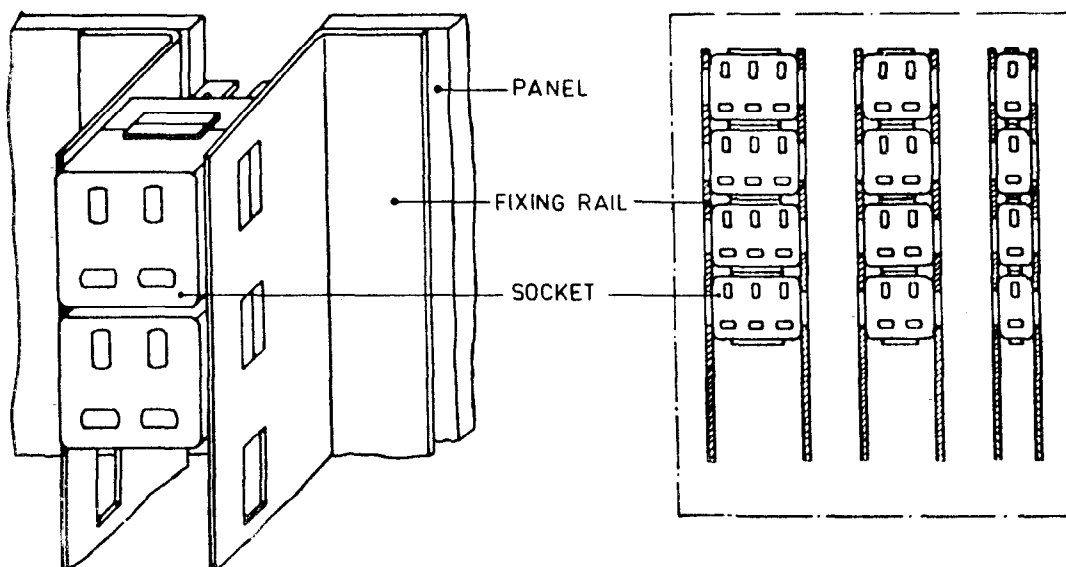


FIG. A-2 FOR RAIL MOUNTING

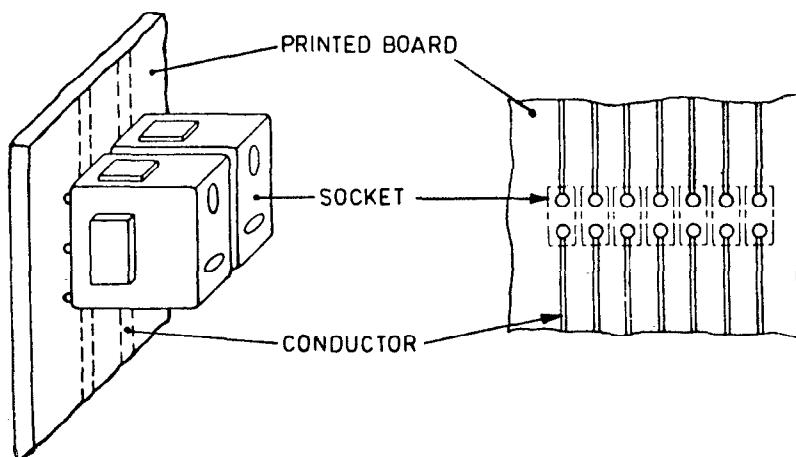


FIG. A-3 STANDING-ON-BOARD MOUNTING

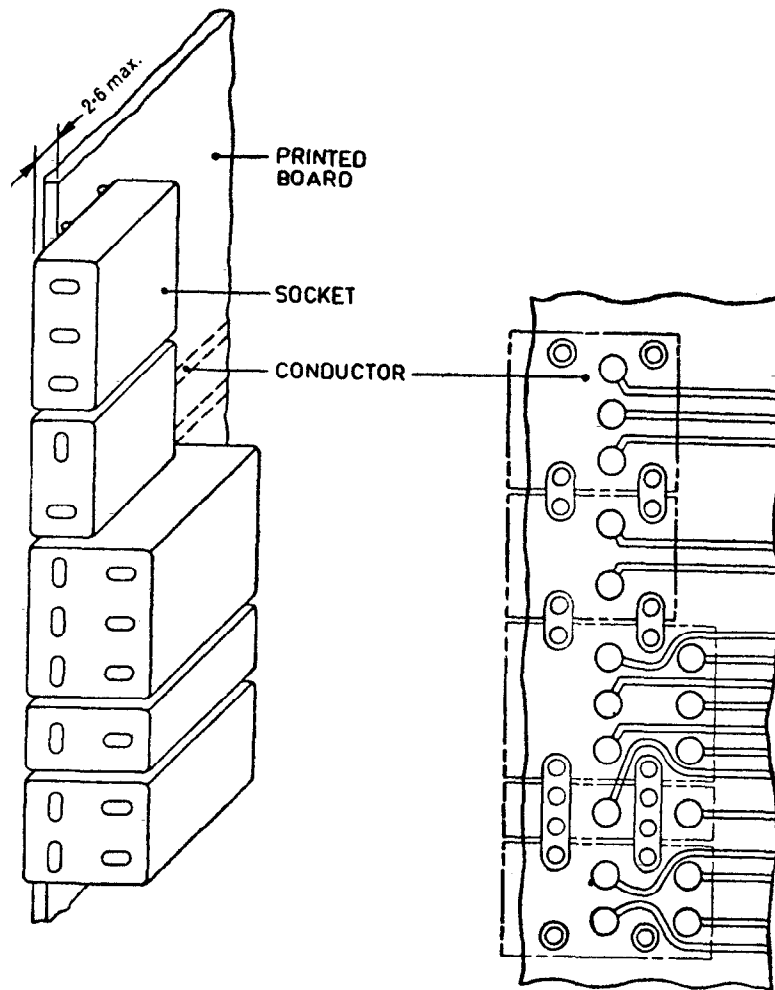


FIG. A-4 PARALLEL-TO-BOARD MOUNTING

ANNEX B (Clause 6.3.2)

EXAMPLES OF APPLICATIONS

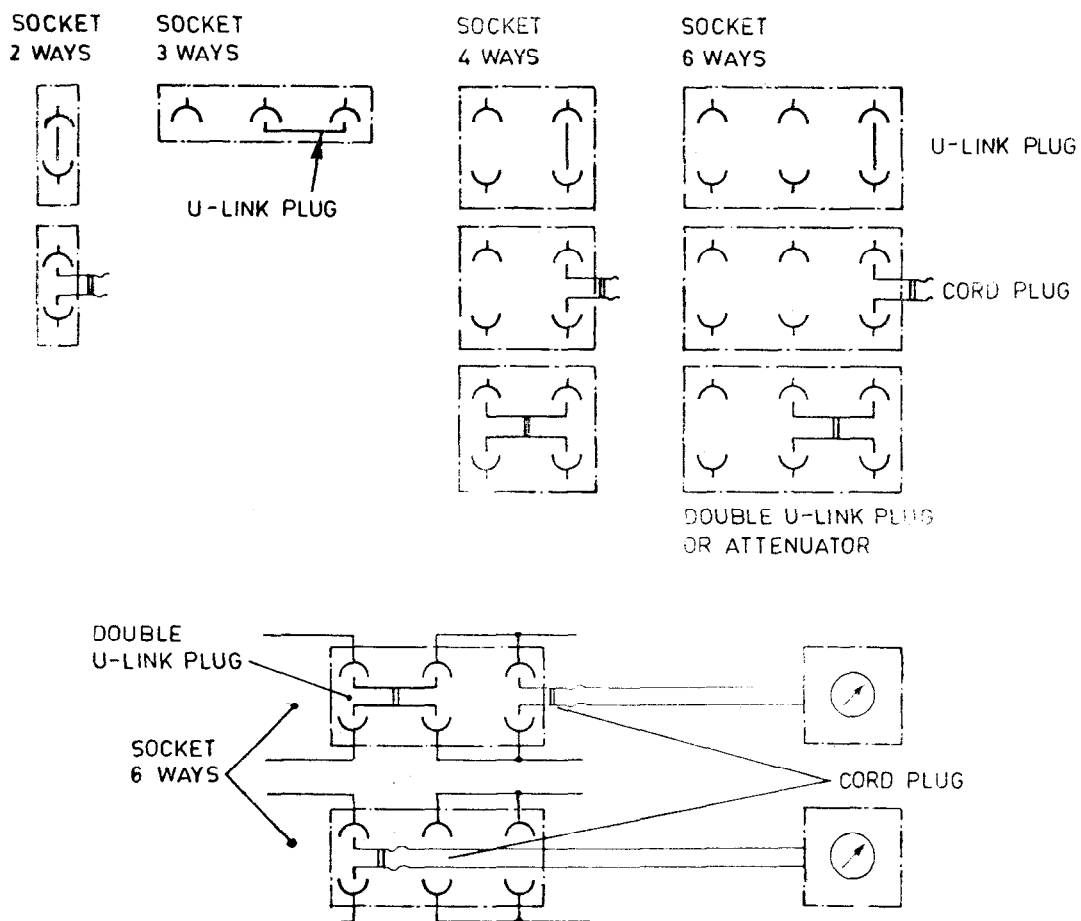


FIG. B-1 APPLICATIONS

ANNEX C
(Table 3)

MECHANICAL AND ELECTRICAL ENDURANCE TESTS (SHORT TERM)

Test	Specific Test Condition and Description	Requirements
Mechanical endurance test (Short term)	A test product shall be fully inserted into the connector socket contacts and withdrawn for a total of 500 insertion and withdrawal cycles, at a rate not to exceed 100 cycles per hour.	
Final measurements	On completion, the following measurements shall be made:	
1) Visual examination	The specimens shall be visually examined.	No mechanical deterioration such as would impair the operation.
Contact resistance	The specimen shall be connected as in Fig. C-1. Measurement shall be made after the temperature of the wire has stabilised with the rated current flowing through the contacts. The potential drop shall be measured across each mated test product and connector between the two points indicated "X" — "X" in Fig. C-1.	The voltage drop shall be not greater than 20 milli-volts.

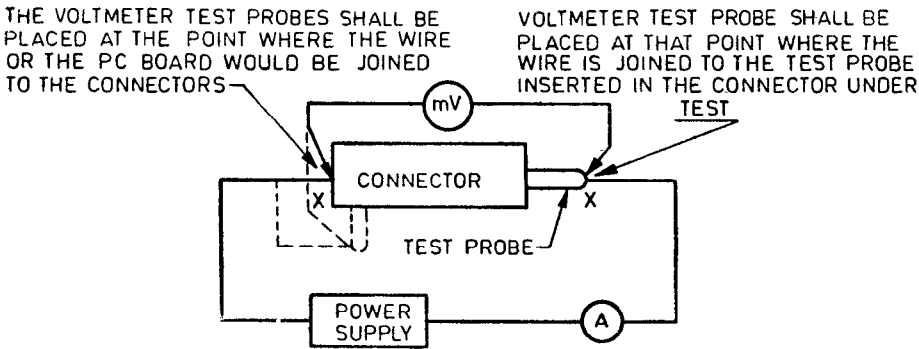
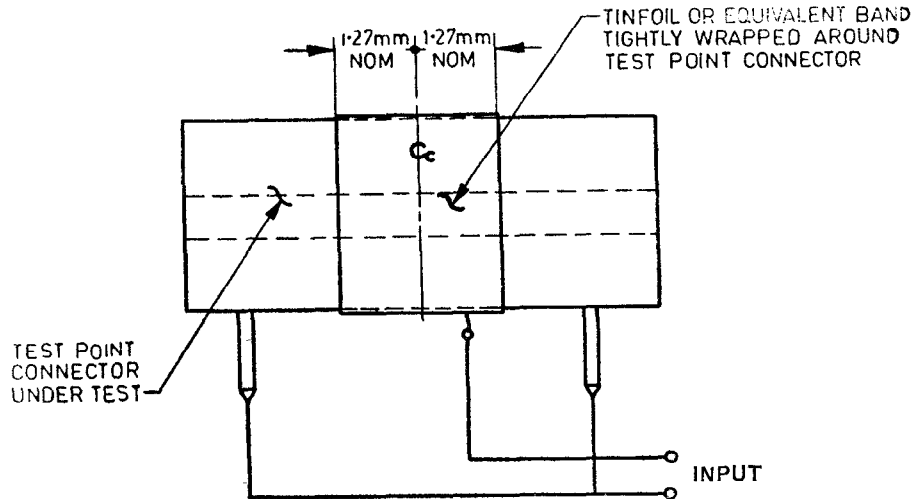


FIG. C-1 TEST CIRCUIT FOR CONTACT RESISTANCE MEASUREMENT

Engagement and disengagement force	Sockets shall be rigidly mounted in a manner to permit mating and unmating of the counter part connectors and with instrumentation capable of measuring the specified forces. Gradually increasing axial load shall be applied until plugs and sockets are in full engagement. Then the forces shall be applied so as to disengage the connectors. The forces shall be measured in both directions.	Engagement force : 20 N (Max) Disengagement force : 1.8 N (Min)
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<i>Test</i>	<i>Specific Test Condition and Description</i>	<i>Requirements</i>
	A test product shall be fully inserted 3 times into the connector socket contact and withdrawn. The test product shall again be inserted and engagement and disengagement forces shall be measured.	
Electrical endurance test (Short term)	The mated sets shall be exposed for a total period of 1 000 h at the maximum temperature of the temperature severity. The temperature severity shall be T65/200 (- 65°C cold) and 200°C (Dry heat). During this period the contacts shall carry their rated current unless otherwise specified. For batch acceptance the duration of exposure shall be 168 hours.	
<i>Final measurements</i>	On completion of the test, following measurements shall be made:	
Visual examination	The specimens shall be visually examined.	No mechanical or electrical deterioration such as would impair the operation.
Contact resistance	This is same as for mechanical endurance test (short term) above.	This is same as for mechanical endurance test (short term) above.
Voltage proof	The specimen shall be mounted as in Fig. C-2. The proof voltage shall be steadily increased from zero to proof value at a rate of approximately 500 V (rms or DC) per sec unless otherwise specified. Upon completion of the test, the proof voltage shall be gradually reduced to avoid voltage surges. The following details shall apply: a) Magnitude and nature of test voltage: At sea level 3 000 V ac (rms), 50 Hz (for a period of 15 S). b) Points of application of test voltage: Between current carrying parts and ground. On multiple contact connectors, the voltage shall be applied between all contacts alternately connected.	There shall be no break down or flashover.

Test	Specific Test Condition and Description	Requirements
Insulation resistance	The specimen shall be mounted as in Fig. C-2. The voltage shall be applied for 1 minute $\pm$ 5 sec (or less if a stable reading has been obtained) the insulation resistance being read at the end of the period.	The insulation resistance shall be not less than 1 000 M ohms.



NOTES

- 1 Meters, bridges or other test equipment, when required shall be incorporated in the circuit.
- 2 Thickness of the conductive band (for example, Tin Foil) shall be such that it can withstand the applied voltage.

FIG. C-2 TEST CIRCUIT FOR VOLTAGE PROOF TEST AND INSULATION RESISTANCE MEASUREMENT

When insulation resistance measurements are made before and after a test, both measurements shall be made under the same conditions, including use of same polarity as the initial measurements. The following details shall apply:

- a) The insulation resistance shall be measured at 100 V dc $\pm$ 10 %.
- b) Points of application of test voltage : Between all contacts and the panel or test mount, and between all adjacent contacts.

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JAIPUR. KANPUR. LUCKNOW. PATNA. THIRUVANANTHAPURAM.